

Uranium In-Situ Solution Mining

Kingsville Dome's PA-3 Data Review Effort

Questions on Monitoring Well Completion Practices



EPA, Region 6
Dallas, Texas

José Eduardo Torres

Petroleum Engineer
Chemical Engineer

Does TCEQ have a set of **Guidelines** in place to assist operators with the Completion of the **Monitoring Wells** used in Uranium in-situ solution mining operations?

Why the Question?...

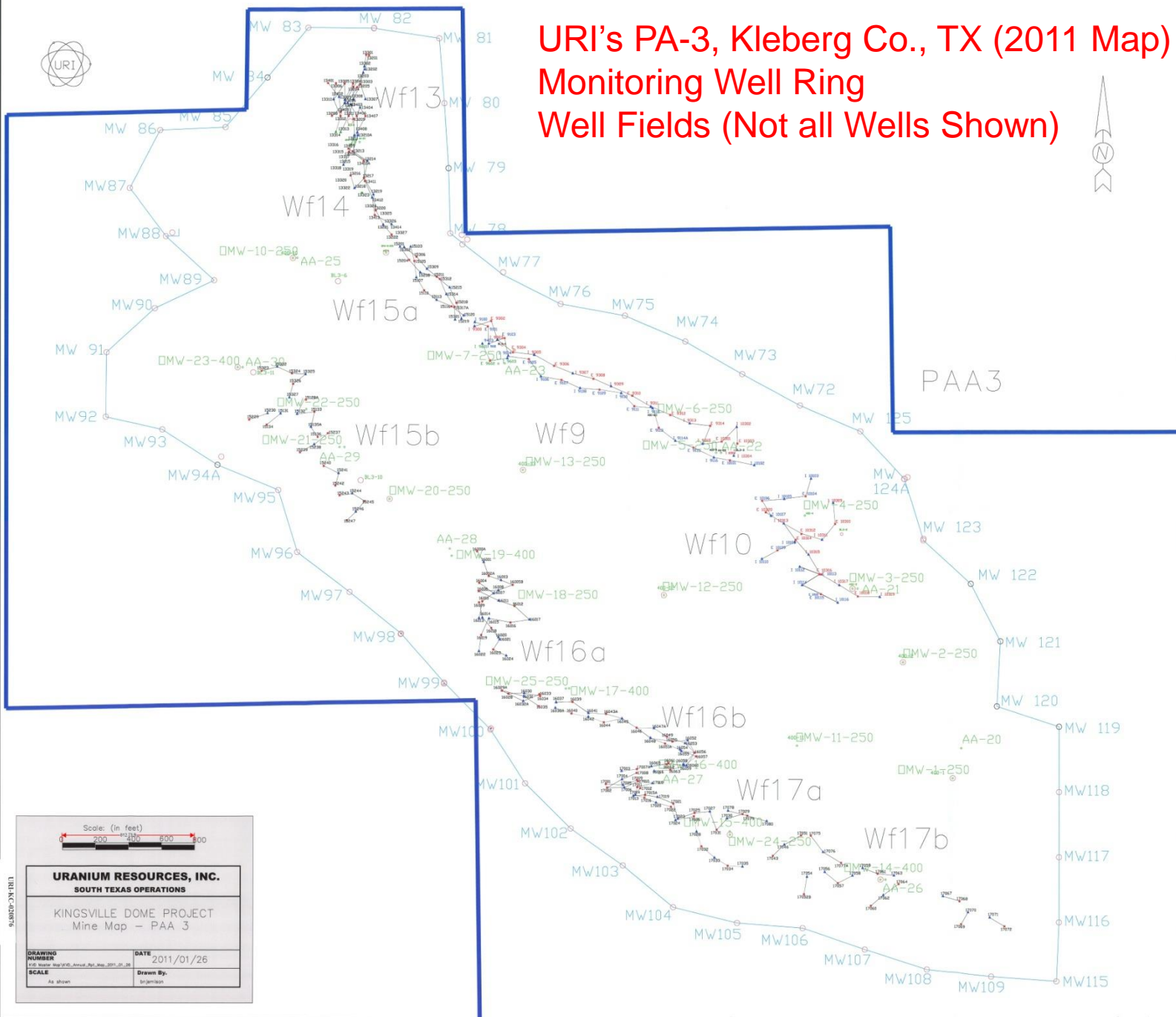
One set of KVD's PA-3 monitoring well (MW) logs was provided by Kleberg County citizens in a PDF file as part of a data package submitted to EPA. The fact that these logs illustrate each well's completion interval provides a unique opportunity to research the in-situ mining monitoring well completion practices in Texas, which may assist in resolving some of the questions brought up in connection with the operations at PA-3. The wells in this set fall in the northern half of the PA's monitoring well ring (see Slide 4), and several of them are located directly down-gradient from where in-situ solution mining of uranium took place.

The PDF file's well logs have been posted in the following slides in order to facilitate the review and analysis of the well completion work executed in these wells. It can be seen that:

- 1.- Except for one well, at this time there is no available documentation confirming that casing cement may have been circulated to the surface (§331.82(a)) in all wells shown.
- 2.- The wells in question were generally drilled to the “AA” Sand and completed in the “A” and “B” Sands. Two of these wells, however, were completed in the “B” Sand only and, where appropriate, the question of isolation between completed and non-completed zones has been raised by annotating the corresponding logs.
- 3.- Perforations/Slots are present nearly across the entire thickness of the selected permeable sands, in about every case.
- 4.- The highest estimated uranium ore grade and the sampled water initial uranium concentration for a given well have been posted on the logs whenever possible.



URI's PA-3, Kleberg Co., TX (2011 Map) Monitoring Well Ring Well Fields (Not all Wells Shown)



URANIUM RESOURCES, INC

HOLE
NUMBER

MW-72A

KLEBERG COUNTY TEXAS

SEC- TWN- RNG-

TD DRILLED - 620
TD LOGGED - 620
LOGGING SPEED - 60 FPM
REFERENCE - SURFACE
BIT SIZE - 5 5/8

ELEVATION -
CASING TYPE - NONE
HOLE FLUID - H2O
DRILLER - DANNY

REMARKS:

COMPUTER LOGGING, INC.
Pleasanton, Texas
Telephone 512-569-6256

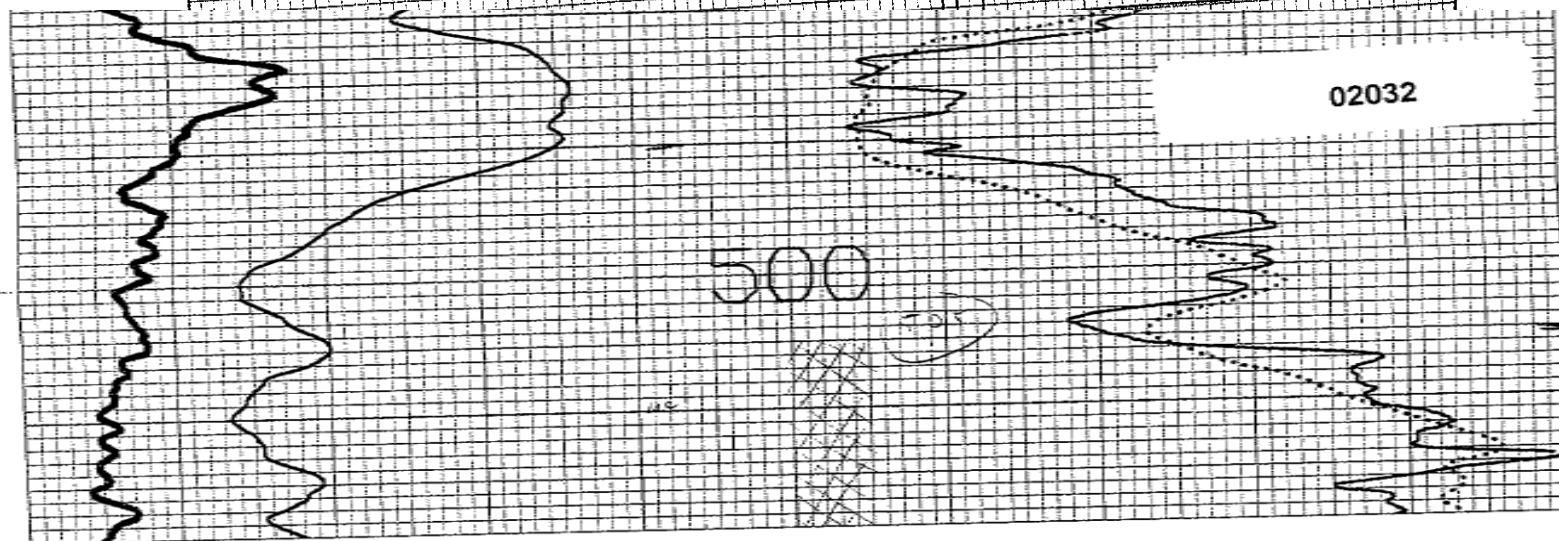
MALDONADO - UNIT: #4
4-19-89 - 1640 HRS

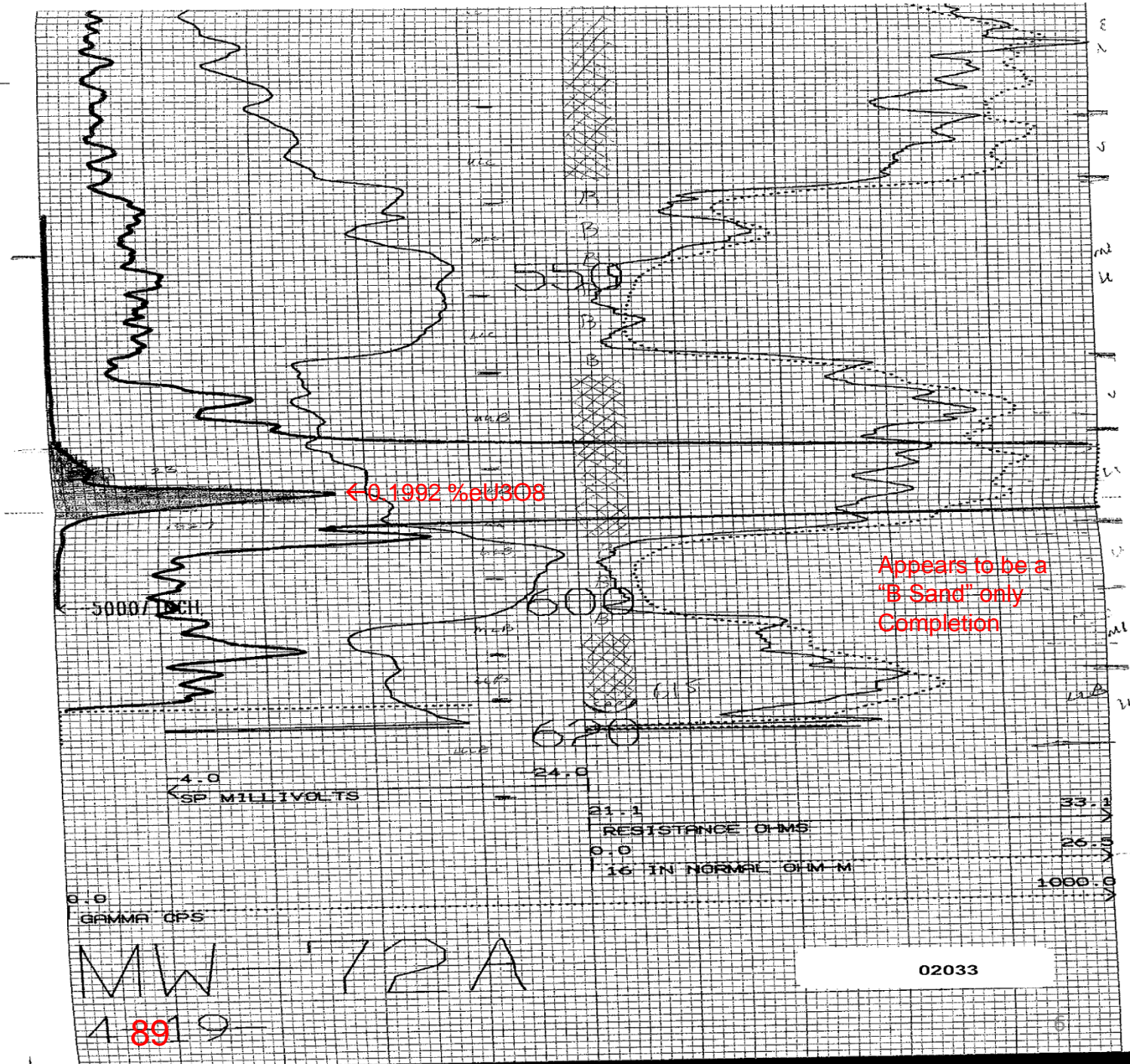
TOOL MODEL/SER.NO.: 20 -4

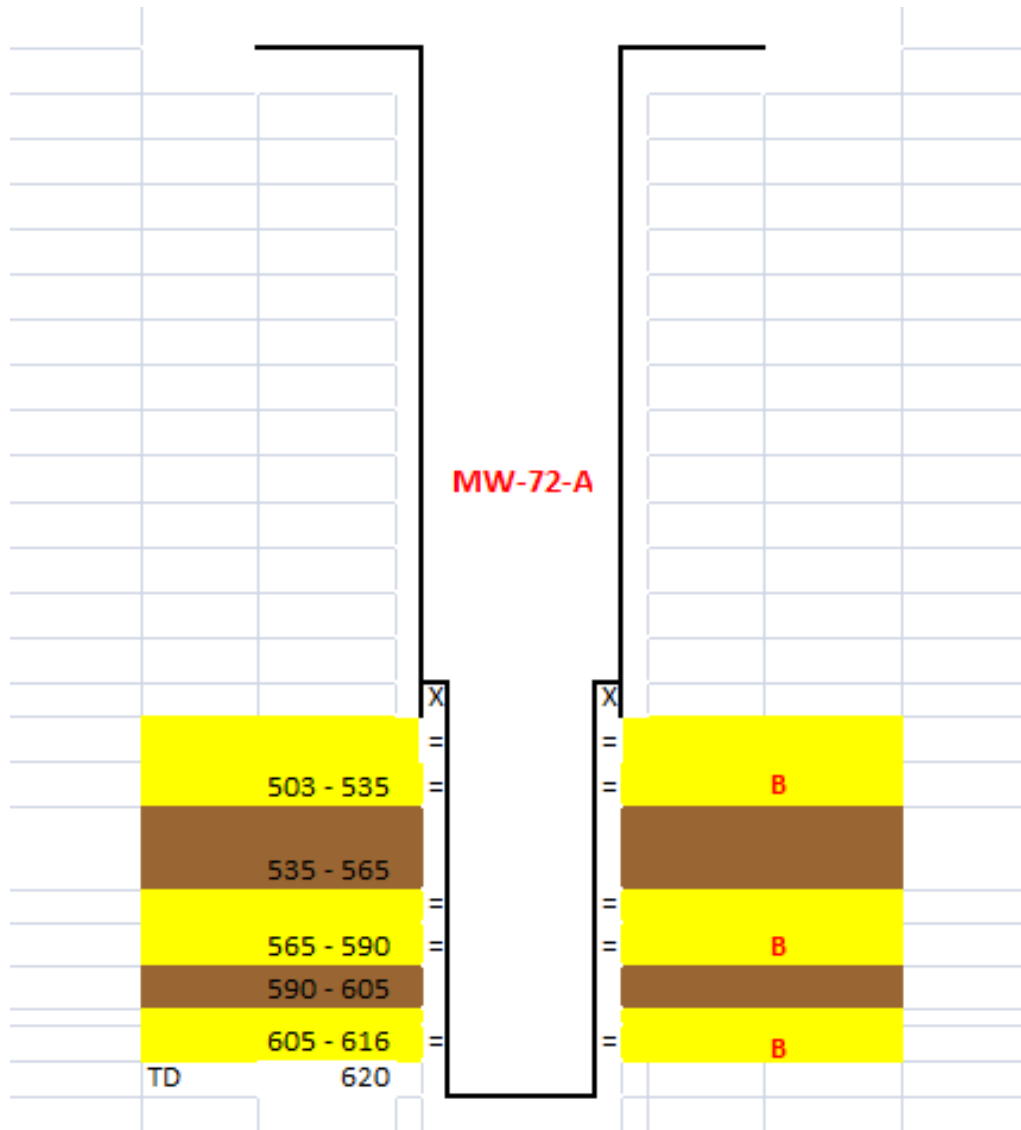
DETECTOR - .875 x 4.0 NaI(Tl)
K-FACTOR - .00000630
DEADTIME - .00000023
TEST PIT - G.W.
LAST CAL. - 3-4-89
WATER FACTOR - 1.18
CASING FACTOR -

DETECTOR - 1 X 6 INCH. HCS
SOURCE - 1.5 Ci. AmBe
SPACING - 14 INCHES

KVD's PA-3
Monitoring Well 72A









Century

GEOPHYSICAL CORP.

MM-78

~ 0.075 mg/L

COMPANY : URI
WELL : MM-78
LOCATION/FIELD : KVB
COUNTY : KLEBERG
STATE : TEXAS
SECTION :

OTHER SERVICES:

TOWNSHIP :

RANGE :

DATE : 01/21/97
DEPTH DRILLER : 760
LOG BOTTOM : 775.10
LOG TOP : 3.90

PERMANENT DATUM : GL
ELEV. PERM. DATUM : GL
LOG MEASURED FROM : GL
DRL MEASURED FROM : GL

ELEVATIONS :
XB : N/A
DT : N/A
GL :

CASING DRILLER : 0
CASING TYPE :
CASING THICKNESS : 0

LOGGING UNIT : 9606
FIELD OFFICE : TULSA
RECORDED BY : B. MATAS

BIT SIZE : 5.625
MAGNETIC DECL. : 8.0
MATRIX DENSITY : 2.65
FLUID DENSITY : 1.0
NEUTRON MATRIX : SANDSTONE
REMARKS :

BOREHOLE FLUID : H2O&GEL
RM :
RM TEMPERATURE :
MATRIX DELTA T : 54
FLUID DELTA T : 212

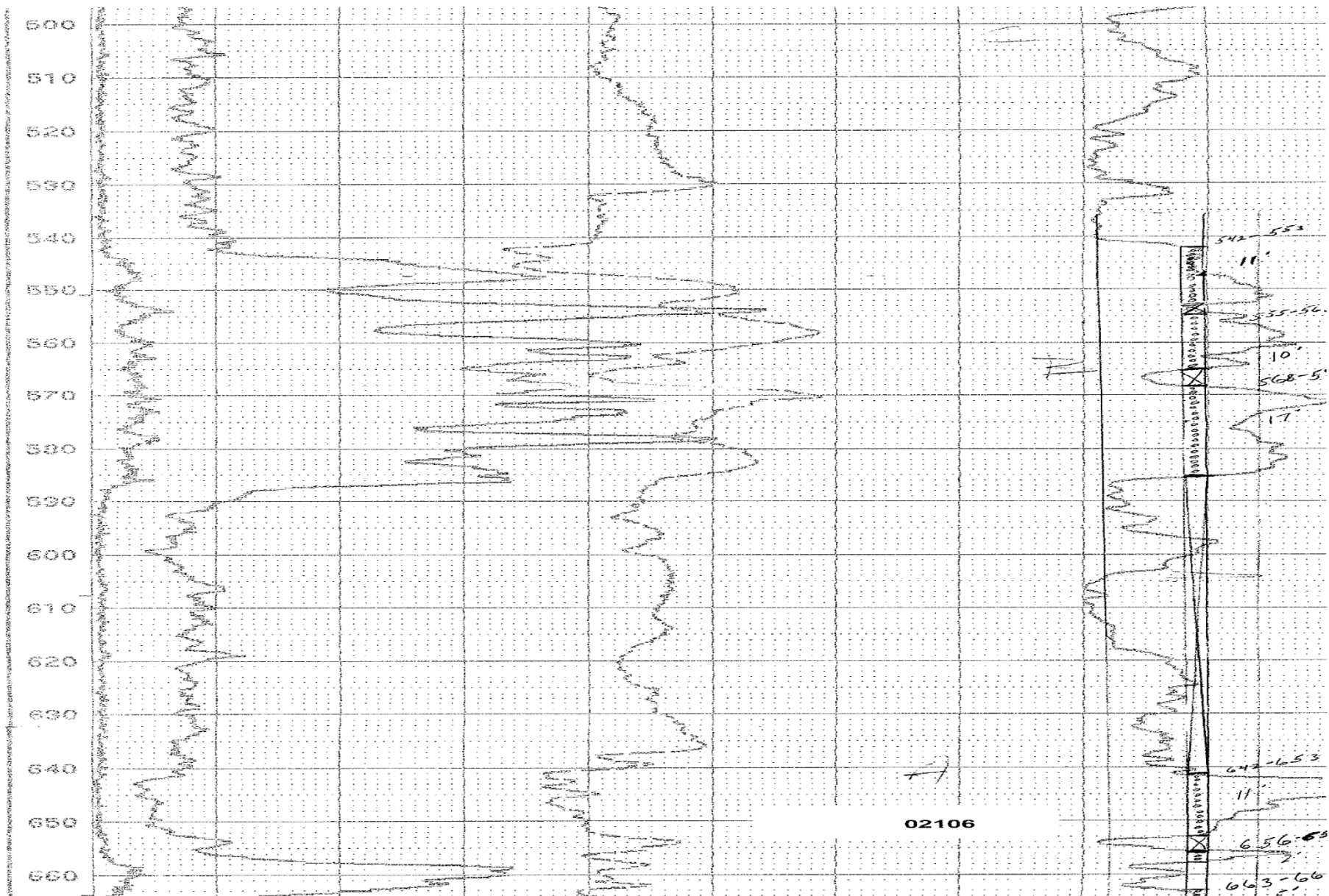
FILE : ORIGINAL
TYPE : 9055C
LOG : 4
PLOT : URAM 0
THRESH : 5000

KF=0.03398

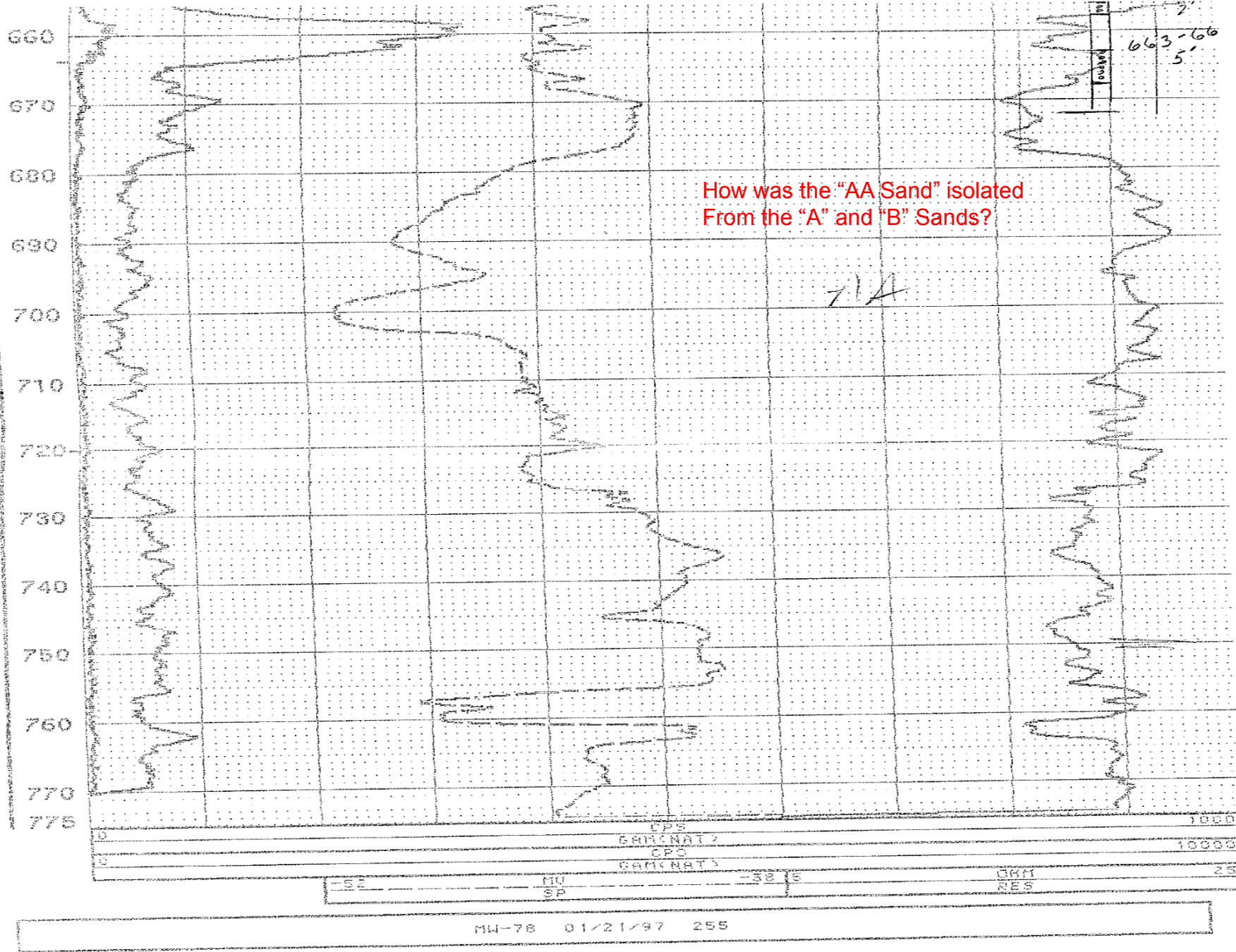
DT=2.70441

WF=1.14

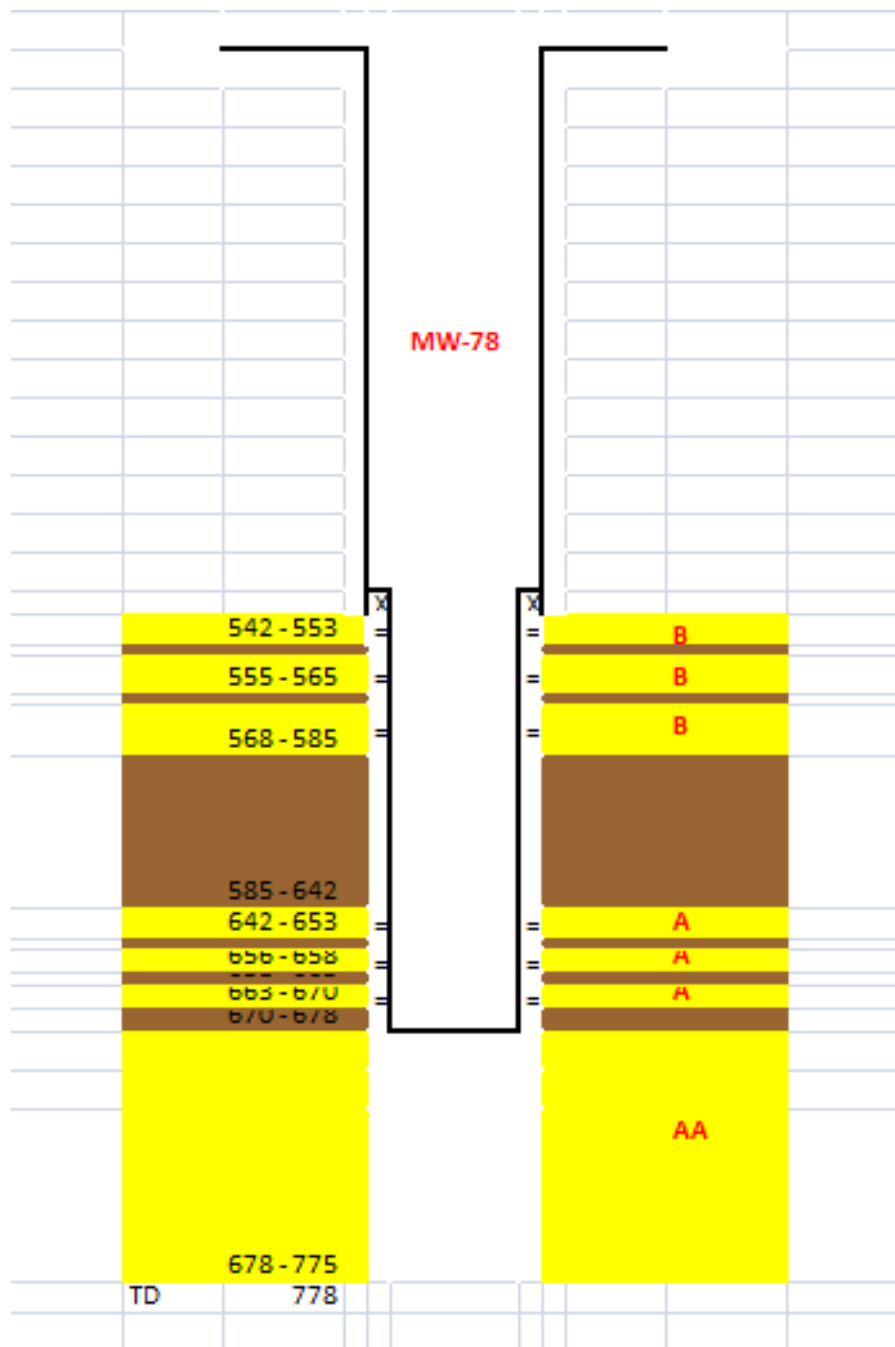
ALL SERVICES PROVIDED SUBJECT TO STANDARD TERMS AND CONDITIONS



MW-78 ~ 0.075 mg/L



MW-78 ~0.075 mg/L





01/17/2007 09:59:05

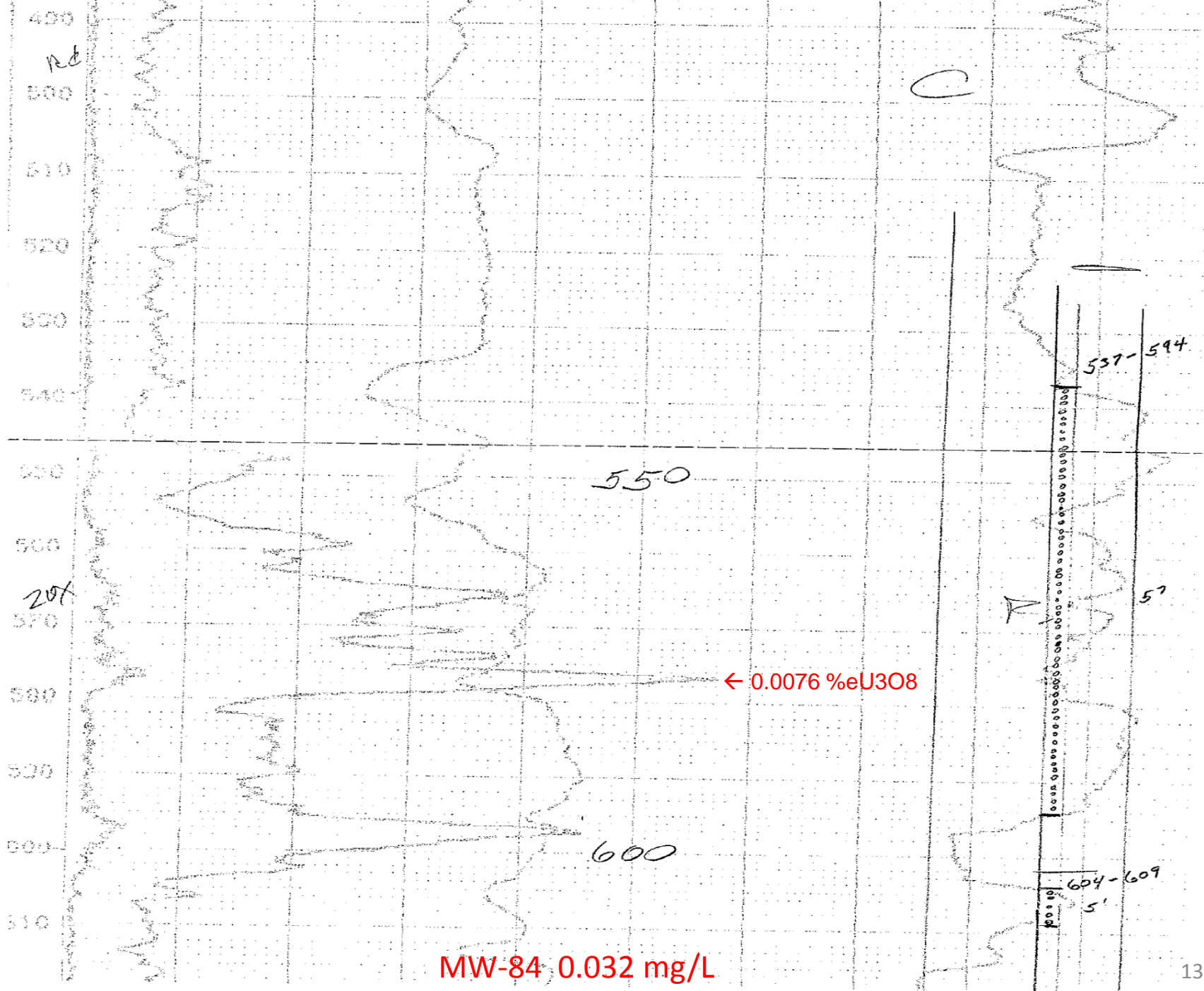
[illegible]

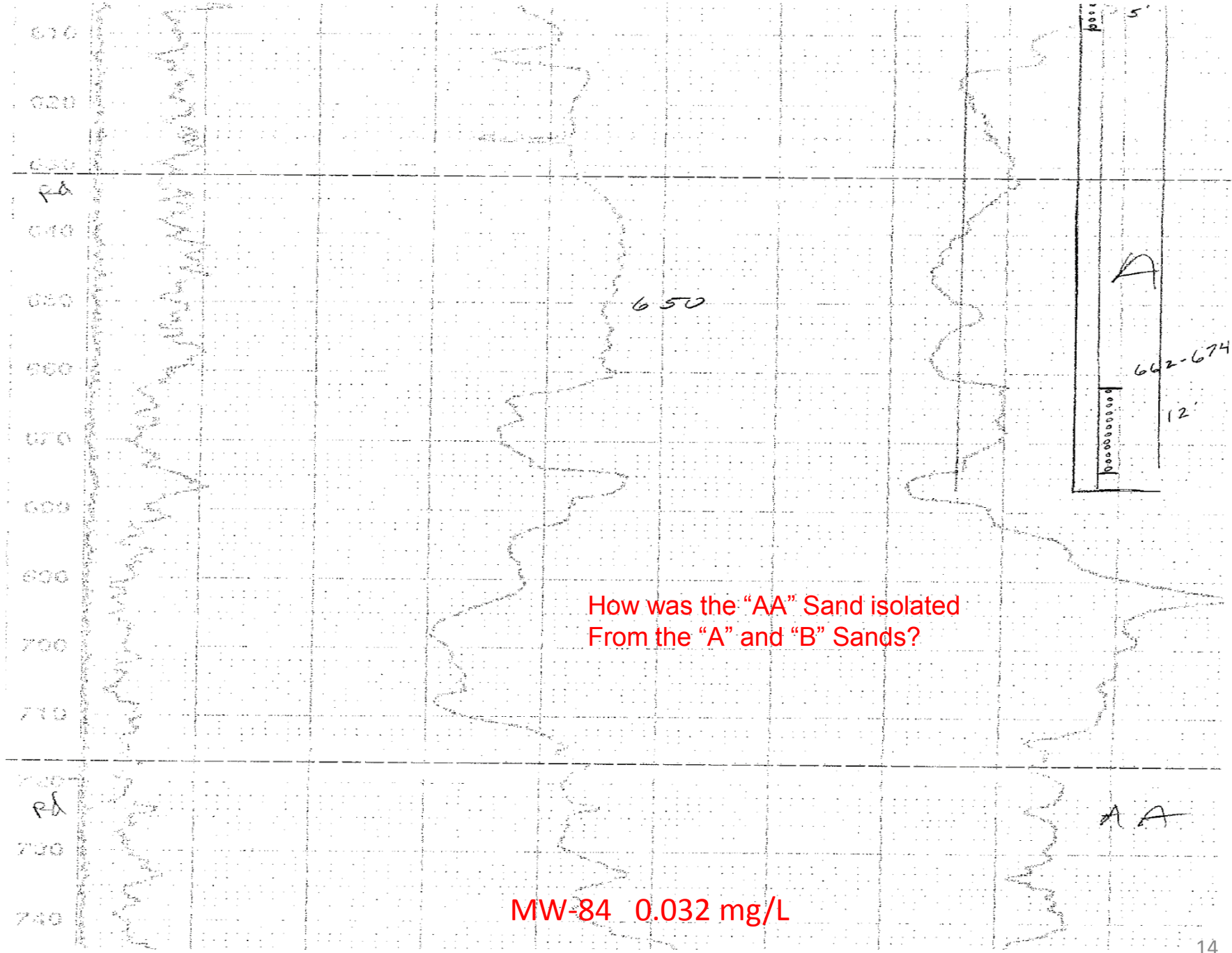
PERMANENT ACTION	CL	ELIGIBILITY
DELEG. TERM. DATED:	CL	ED / M / Y
END DELEGATED TERM:	CL	ED / M / Y
END INDEFINITE TERM:	CL	ED /

ADDRESS : 9405
 STREET : 11111
 CITY : S. GILLES

[illegible]

MW-84 0.032 mg/L







Century
GEOPHYSICAL CORP.

NW-85

0.018 mg/L

COMPANY : URI
WELL : NW-85
LOCATION/FIELD : KUD
COUNTY : KLEBERG
STATE : TEXAS
SECTION :

OTHER SERVICES:

TOWNSHIP : RANGE :

DATE : 01/28/97
DEPTH DRILLER : T80
API DEPTH : 775.38
LOG TOP : 3.50

PERMANENT DATUM : CL ELEVATIONS
ELEV. PERM. DATUM: CL XD : N/A
LOG MEASURED FROM: CL DE : N/A
DEP MEASURED FROM: CL CL :

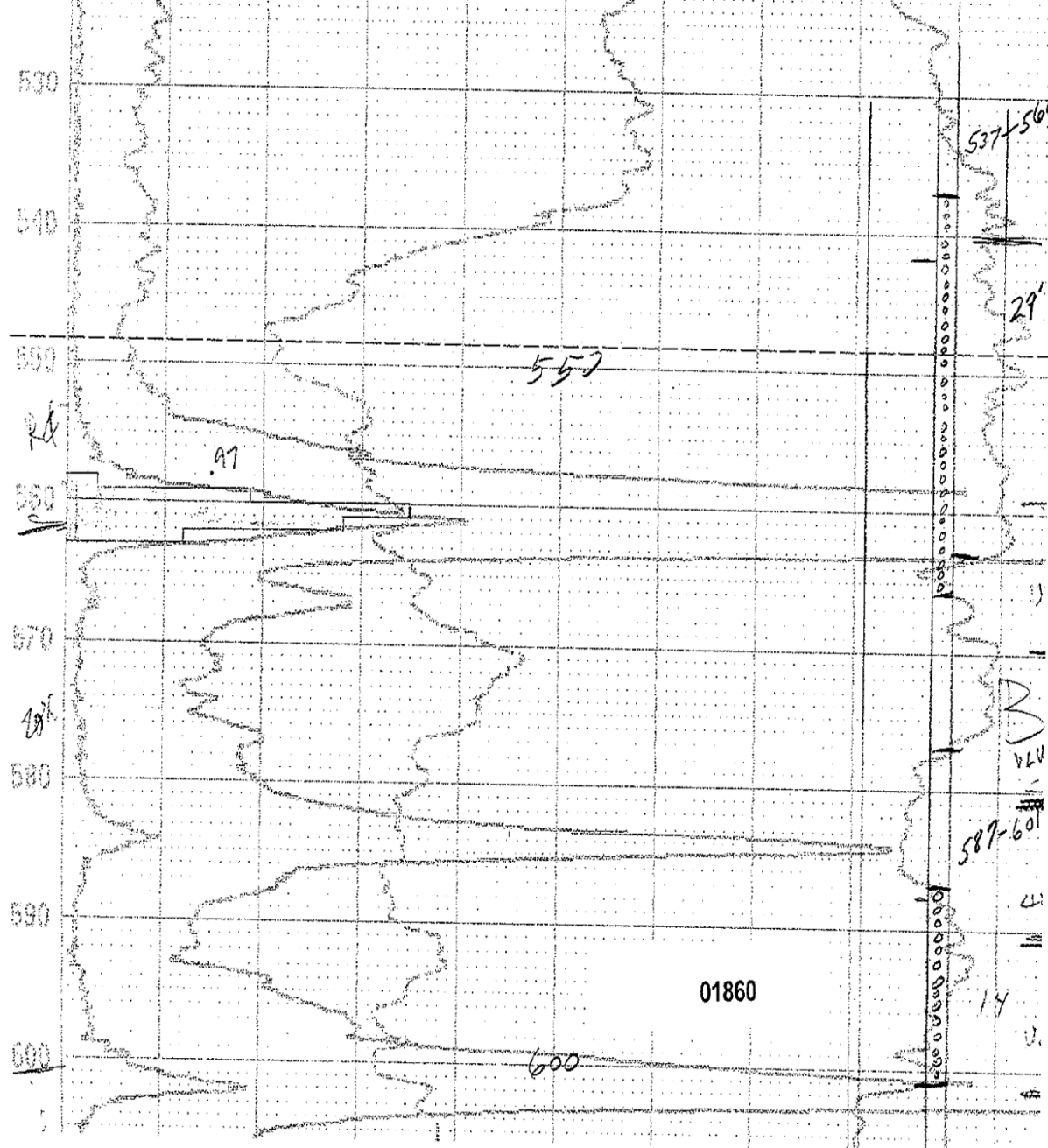
CASING DRILLER : B
CASING TYPE :
CASING THICKNESS: B

LOGGING UNIT : 5606
FIELD OFFICE : TULSA
RECORDED BY : B. MAIRS

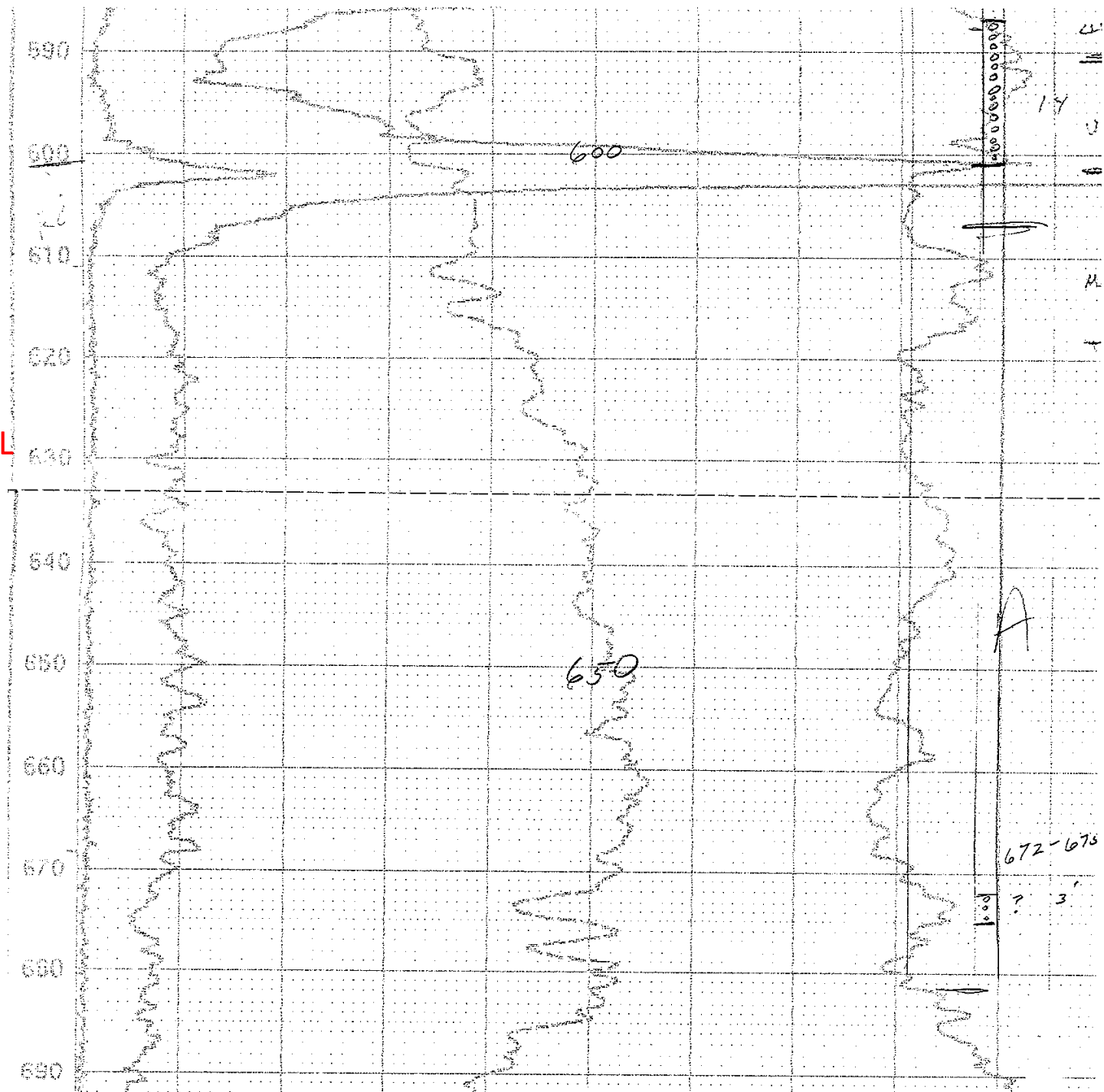
WIT SIZE : 3.125
ANALYTIC DEPT. : 8.0
MATRIX DENSITY : 2.65
FLUID DENSITY : 1.0
MATERIAL MATRIX : SANDSTONE
REMARKS :

MUDHOLE FLUID : MUDGAL FILE : ORIGINAL
BH : TYPE : ORGEL
BH TEMPERATURE : LOG : 3
MUDHOLE FLUID T : 54 PILOT : 1000 5
FLUID DENSITY Y : 0.94 TRESH : 1000

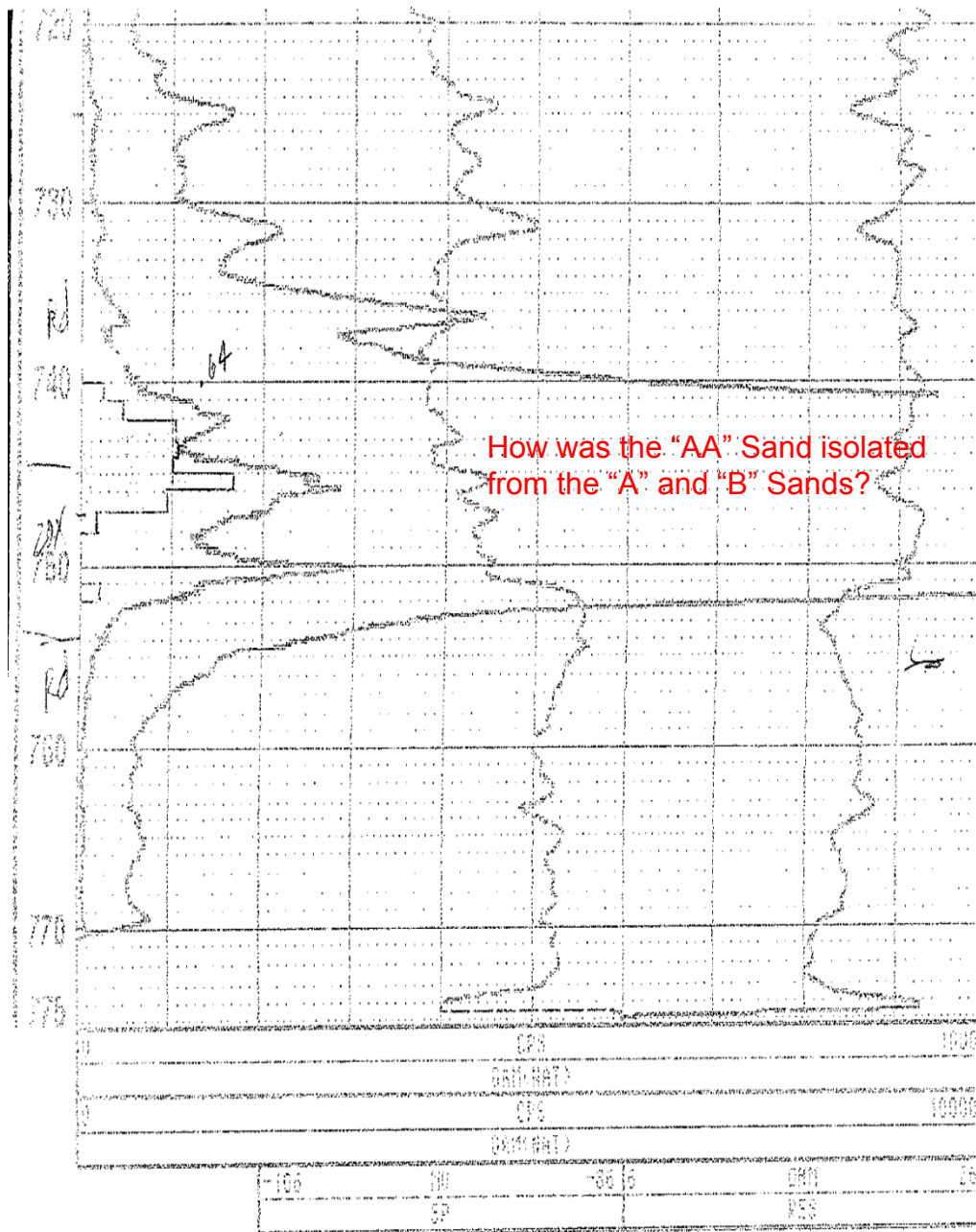
MW-85
0.018 mg/L

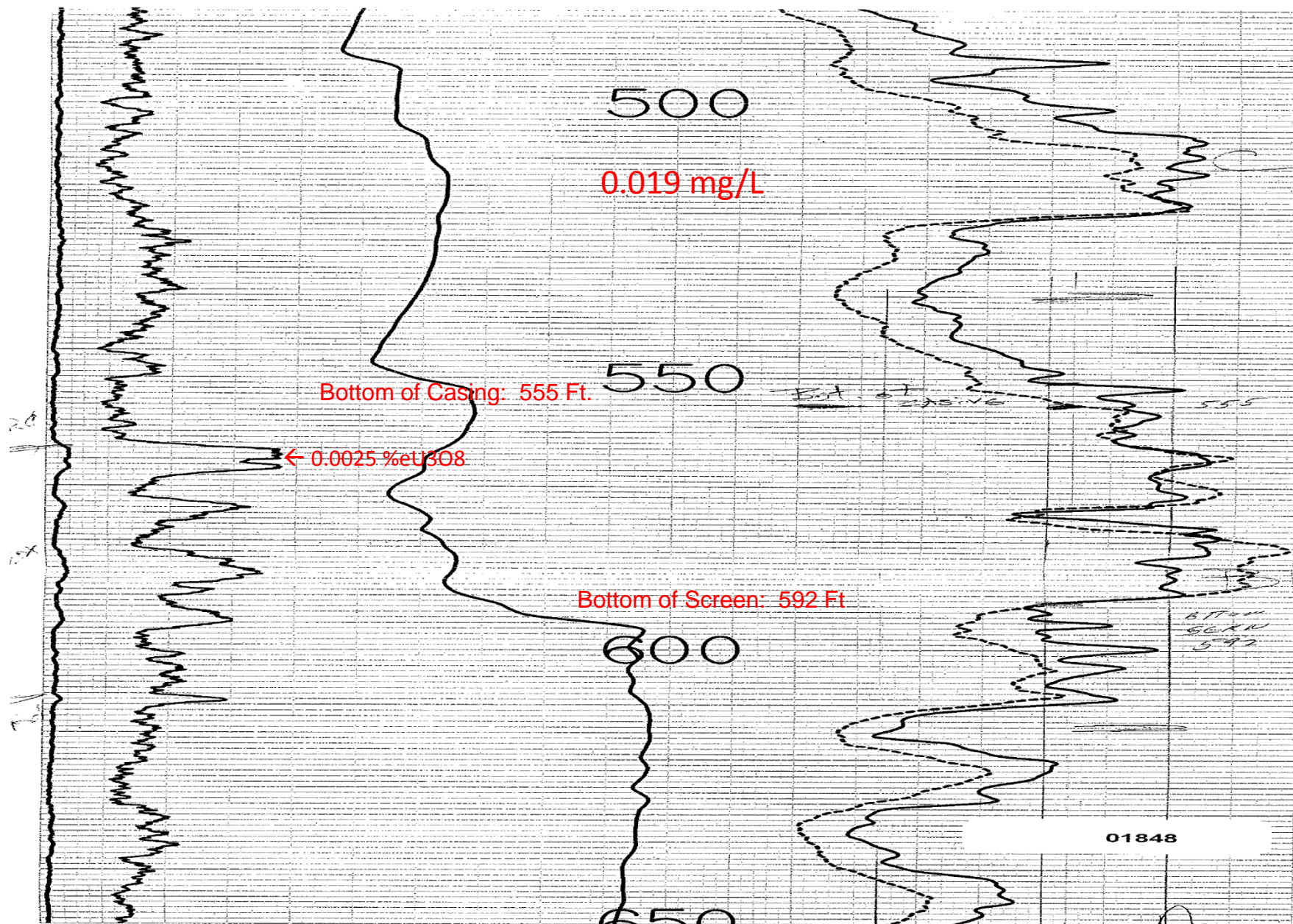


MW-85
0.018 mg/L



MW-85
0.018 mg/L





Rd

How were the "A" and "AA"
Sands isolated from the
"B" Sand?

650

700

719

A

AA

0.0

100.0 CPS/IN
GAMMA (CPS)

1000.0

105.0

SP (MVOLTS)

56.0 10.0

RES (OHMS)

25.0

21.0

SN (OHM-M)

69.0

0.0

1000.0 CPS/IN
GAMMA HI

10000.0

HOLE: MW 86

0.019 mg/L

01849

DATE: Fri Feb 14 18:41:11 1997

HOLE
NUMBER

URI

MW 87

KLEBERG COUNTY TEXAS

SEC: --- TWN: --- RNG: ---

KVD

TD DRILLED - 680' ELEVATION - μ
TD LOGGED - 683.0' CASING TYPE - NONE
LOGGING SPEED - 60'/MIN. HOLE FLUID - H2O
REFERENCE - SURFACE DRILLER - AMADOR
BIT SIZE - 5 5/8"

REMARKS:

0.025 mg/L

URI

Corpus Christi, Texas

Telephone 512-279-3342

Magill - UNIT: L-1
02-15-97 - 1450 HRS

TOOL MODEL/SER. NO.: 2025-3

DETECTOR - .875 X 4.0 NaI(T)
K-FACTOR - .00000596
DEADTIME - .00000233
TEST PIT - G.W.
LAST CAL. - 4-10-96
WATER FACTOR - 1.142
CASING FACTOR -

NATURAL GAMMA

DETECTOR - 1 X 6 INCH HE3
SOURCE - 1.5 Ci AmBe
SPACING - 14 inches

NEUTRON

SINGLE POINT RESISTANCE
SP/16 INCH NORMAL
64 INCH NORMAL

ELECTRIC LOGS

535 - BTM OF CASING

550

How was the "A" Sand isolated
From the "B" Sand?

600

MW-87
0.025 mg/L

650

536-540

4'

549-552

3

B

573-602

29'

607-611

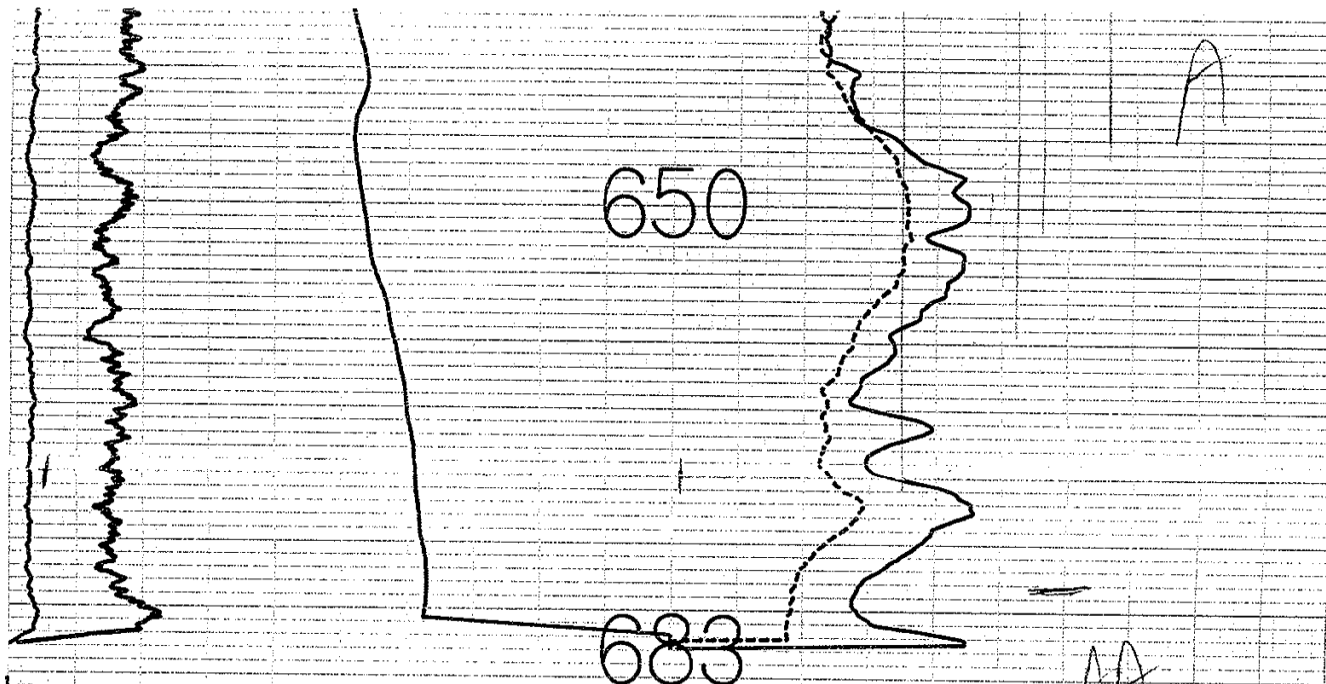
4'

615-620

5'

01842

A



0.0 100.0 CPS/IN 1000.0

GAMMA (CPS)

74.0 20.0 14.0 33.0

SP (MVOLTS)

RES (OHMS)

37.3 103.3

SN (OHM-M)

0.0 500.0 CPS/IN 5000.0

GAMMA HI

HOLE: MW 87 0.025 mg/L

DATE: Sat Feb 15 14:48:57 1997

HOLE
NUMBER

URI
MW 89

KLEBERG COUNTY TEXAS

SEC: --- TWN: --- RNG: ---

KVD

TD DRILLED - 685.0' ELEVATION - μ
TD LOGGED - 684.8' CASING TYPE - NONE
LOGGING SPEED - 60'/MIN. HOLE FLUID - H2O
REFERENCE - SURFACE DRILLER - LEO
BIT SIZE - 5 5/8"

REMARKS:

~ 0.022 mg/L

URI

Corpus Christi, Texas
Telephone 512-279-3342

TALBOTT - UNIT: L-4
02-20-97 - 1030 HRS.

TOOL MODEL/SER. NO.: 2025-1

NATURAL GAMMA

DETECTOR - .875 X 4.0 NaI(T)
K-FACTOR - .00000573
DEADTIME - .00000023
TEST PIT - G.W.
LAST CAL - 6-27-96
WATER FACTOR - 1.142
CASING FACTOR -

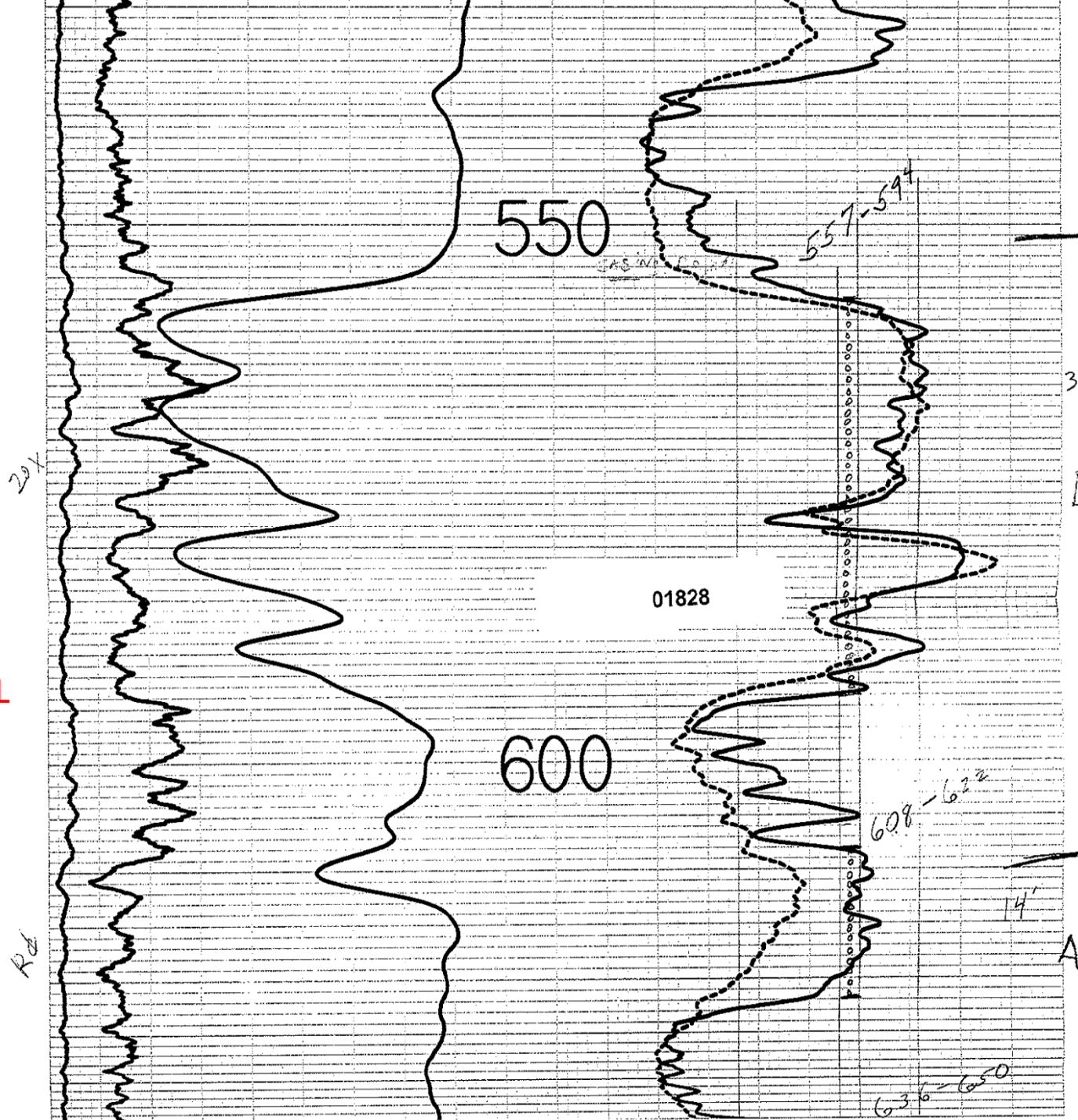
NEUTRON

DETECTOR - 1 X 6 INCH HE3
SOURCE - 1.5 Ci AmBe
SPACING - 14 inches

ELECTRIC LOGS

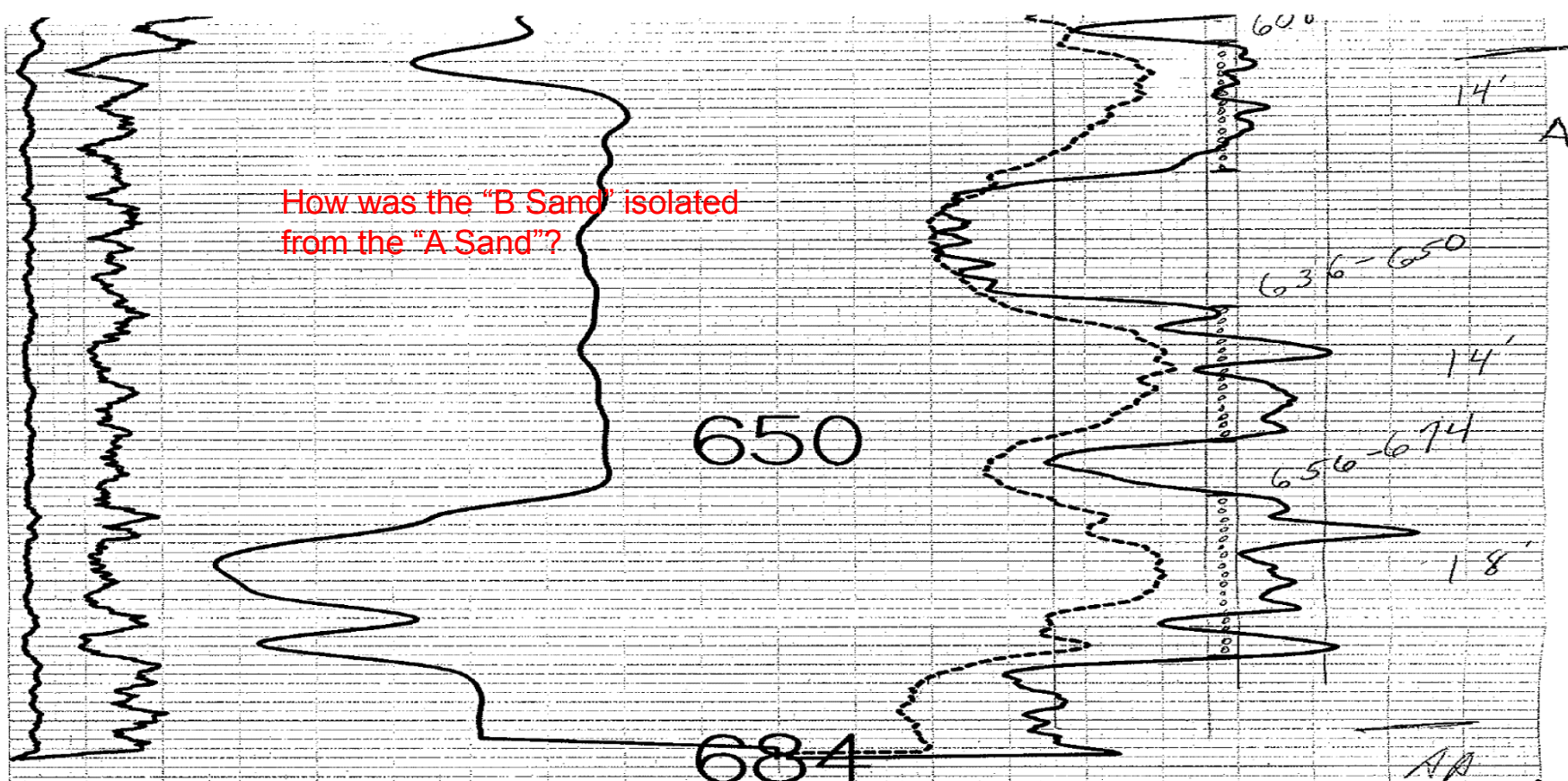
SINGLE POINT RESISTANCE
SP/16 INCH NORMAL
64 INCH NORMAL

MW-89
~ 0.022 mg/L



KP

How was the "B Sand" isolated from the "A Sand"?



0.0 100.0 CPS/IN 1000.0
GAMMA (CPS)

44.0 14.0 6.0 14.0
SP (MVOLTS) RES (OHMS)

22.9 61.9
SN (OHM-M)

0.0 500.0 CPS/IN 5000.0
GAMMA HI

HOLE: MW 89 ~ 0.022 mg/L
DATE: Thu Feb 20 10:28:27 1997 28

HOLE NUMBER	URI MW91		URI	Corpus Christi, Texas Telephone 512-279-3342
KLEBERG COUNTY TEXAS			TALBOTT -- UNIT: L-4 02-18-97 -- 1730 HRS	
SEC: --- TWN: --- RNG: ---			TOOL MODEL/SER. NO.: 2025-1	
KVD			<div style="display: flex; justify-content: space-between;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); font-weight: bold;">NATURAL GAMMA</div> <div> DETECTOR -- .875 X 4.0 NaI(T) K-FACTOR -- .00000573 DEADTIME -- .00000230 TEST PIT -- G.W. LAST CAL -- 8-27-96 WATER FACTOR -- 1.142 CASING FACTOR -- </div> </div>	
TD DRILLED -- 700.0 TD LOGGED -- 700.9' LOGGING SPEED -- 60'/MIN. REFERENCE -- SURFACE BIT SIZE -- 5 5/8"			<div style="display: flex; justify-content: space-between;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); font-weight: bold;">ELECTRIC LOGS</div> <div> SINGLE POINT RESISTANCE SP/16 INCH NORMAL 64 INCH NORMAL </div> </div>	
REMARKS:			<div style="display: flex; justify-content: space-between;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); font-weight: bold;">NEUTRON</div> <div> DETECTOR -- 1 X 6 INCH HE3 SOURCE -- 1.5 Ci AmBe SPACING -- 14 inches </div> </div>	



500

MW-91

550

580 BTHM
1.15 IN 5

600

How was the "B Sand" isolated
from the "A Sand"?

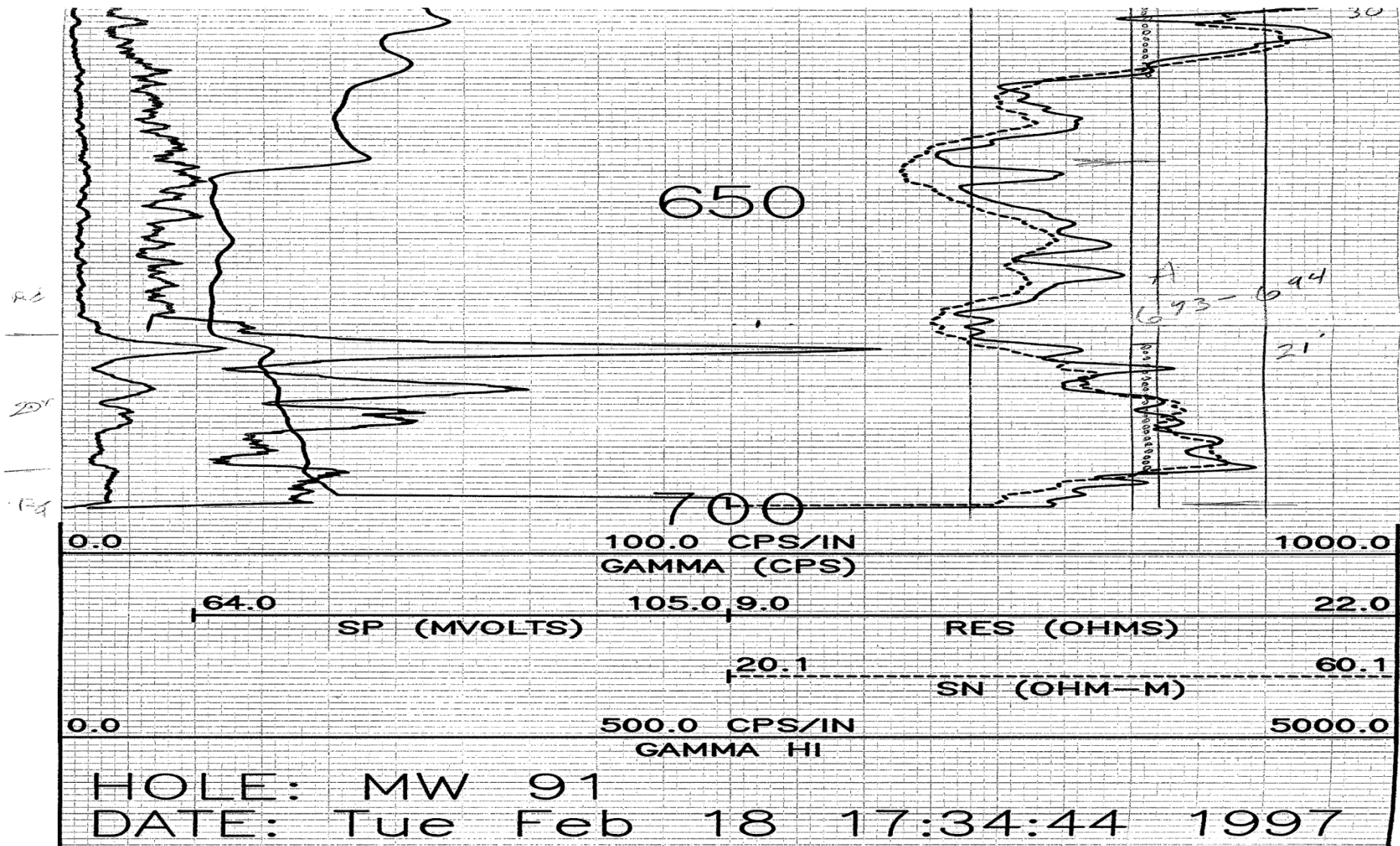
650

583-595
12'

600-630

30'

01984



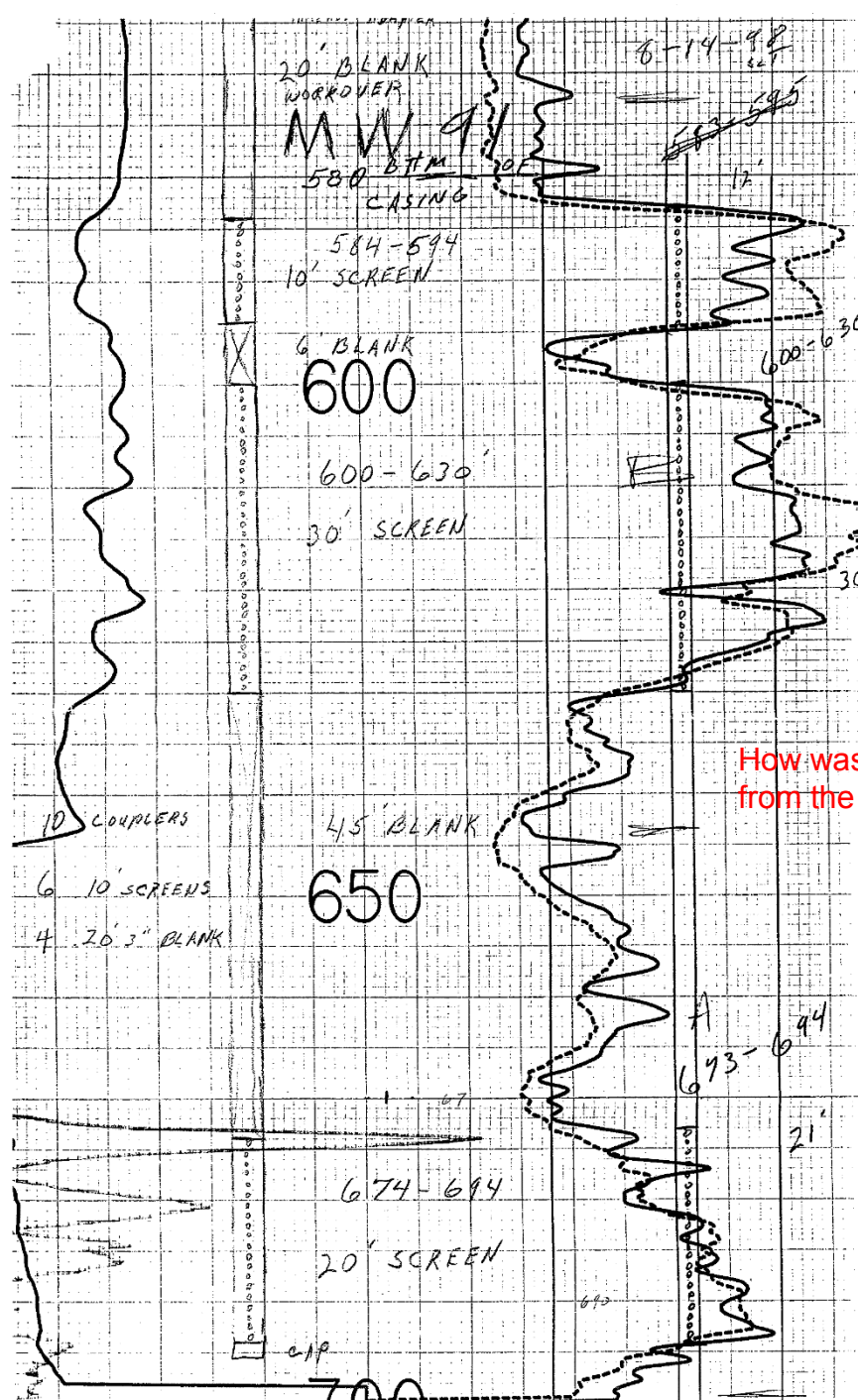
DEVIATION SURVEY

HOLE: MW 91
DATE: FEB 18, 1997
TRUE DEPTH : 700.7
DEVIATION : 9.2
BEARING : 343.8
SCALE FT/IN: 4.0

4 NORTH

01985

MW-91



URANIUM RESOURCES, INC.
KINGSVILLE DOME PROJECT, KLEBERG COUNTY,
TEXAS

TNRCC WELL NUMBER MW-91

URI WELLFIELD DESIGNATION: MW-91

LOCATION: LOT 1, BLK 55, KLEBERG TOWN IMPROVEMENT CO

SURFACE ELEVATION: 50.91

FT. ASL

DATE Cased: 2/21/97

*** DRILLING DATA ***

DRILLING CONTRACTOR: TRIPLE-C

MUD: NATIVE W/ POLYMER ADDITIVES

BIT SIZE: 7.875 INCHES

CIRCULATION LOSS?: NO

DRILL CUTTINGS COLLECTED EVERY 10' TO 100', THEN EVERY 5' TO TD.

*** CASING DATA ***

CASING OD: 5.56 INCHES

TYPE OF CASING: 5" SDR 17 PVC

SET AT: 530 FT.

CASING ID: 4.90

INCHES

CENTRALIZERS: 3

CEMENT BASKET @:

FT.

*** CEMENT DATA ***

CLASS: ASTM TYPE IP

SLURRY VOLUME: 137 FT³

DENSITY: 13.1 LB/GAL

ADDITIVES: BENTONITE GEL

CIRCULATED CEMENT WITH 0.5 BBLs RETURNS ←

WKS USED: 74.2

YIELD: 1.85 FT³/SACK

EXCESS VOLUME: 50 % ANN. VOL.: 89. FT³

*** COMPLETION DATA ***

COMPLETION TYPE: DRILL BELOW CSG. W/SOCKED ZONES:

INTERVAL(S):

583

-

694

FT

SCREEN SIZE: 3

INCHES

PERFORATING CONTRACTOR/SHOTS PER FOOT: N/A

PACKER SIZE AND TYPE: 5" PVC K-PACKER

PACKER SET AT: 563

FT

*** LOGGING DATA ***

LOGGING CONTRACTOR: URI, Inc.

LOGS RUN: SP, GAMMA, SINGLE PT./16 INCH RES.

A SCREEN CONFIRMATION LOG WAS RUN (GAMMA RAY - SINGLE POINT RESISTIVITY)

*** MECHANICAL INTEGRITY TEST ***

INITIAL PRESSURE: 150

FINAL PRESSURE: 145

PRESSURE DROP: 5

ALL PRESSURES ARE IN PSIG, WITH A PRESSURE TEST DURATION OF 1 HOUR

I, JAM P. GORANSON, WELLFIELD SUPERINTENDENT, DO HEREBY STATE THAT I HAVE
KNOWLEDGE OF THE FACTS HEREIN AND THAT THE SAME ARE TRUE AND CORRECT TO THE
BEST OF MY KNOWLEDGE AND BELIEF.

DATE:

June 25, 1997

SIGNATURE:



MW-91

§331.122. Class III Wells.

The commission shall consider the following before issuing a Class III Injection Well or Area Permit:

(1) all information in the completed application for permit;

(2) all information in the Technical Report submitted with the application for permit, including the following:

(A) a map showing the injection well(s) and area for which the permit is sought and the applicable area of review. Within the area of review, the map must show the number, or name, and location of all existing producing wells, injection wells, dry holes, surface bodies of water, mines (surface and subsurface), quarries, public water systems, water wells, and other pertinent surface features, including residences and roads. The map should also show faults, if known or suspected. Only information of public record is required to be on this map. If production area authorizations are required prior to the commencement of mining, the proposed production areas must be shown on the map;

(B) a tabulation of reasonably available data on all wells within the area of review which penetrate the proposed injection zone. This data shall include a

(L) expected changes in pressure, native fluid displacement, direction of movement of injection fluid;

§331.224. Record of Strata.

The executive director may require a person receiving a Class III well permit or production area authorization to maintain and provide, upon request, complete and accurate records of the depth, thickness, and character of the strata penetrated in drilling an injection well, monitoring well, or production well.

Adopted February 11, 2009

Effective March 12, 2009

§331.225. Geophysical or Drilling Log.

If an existing well is to be converted to an injection well, monitoring well, or production well, the commission may require the applicant to provide a geophysical log or a drilling log of the existing well.

Adopted February 11, 2009

Effective March 12, 2009

3. Mine area Geology and Hydrology

.
. .

Three mineralized, water-bearing sands have been recognized in the Goliad in an interval from approximately 420 to 810 feet below MSL. These sands vary in thickness from 30 to 50 feet each and have been arbitrarily designated the C, B, and A sands. The B and A sands will be the zones of uranium production. The C sand is shaly and unmineralized in this particular production area. The B and A sands are prolific producers of ground water with typical transmissivities of 9,600 gpd/ft.

Underlying the B and A sands is the A clay and the "AA" sand. The A clay is 10 to 20 feet thick within the production area and is primary aquitard between the production zones and the AA sand. The AA sand is approximately 70 feet thick in the production area and constitutes the first underlying sand.

In other portions of the Kingsville Dome vicinity, the AA sand is mineralized and may be developed for uranium production in the future. The AA sand is a very good producer of ground water with the exception of a couple of areas.

.
. .

Uranium Ore Yield as a Function of Ore Grade

	Percent U ₃ O ₈	Ore Content Pounds/Ton
Extra High Grade	2.00 or Higher	40
High Grade:	0.50 to 2.00	10 to 40
Medium Grade:	0.10 to 0.50	2 to 10
Low Grade:	0.05 to 0.10	1 to 2